



**Independent Acoustic
Consultancy Practice**

Noise Impact Assessment

**Traherne Court
Neath**

7448/NIA1



Independent Acoustic Consultancy Practice

Henstaff Court Business Centre
Llantrisant Road, Cardiff
CF72 8NG

t:
e:

w: www.hunteracoustics.co.uk

Noise Impact Assessment

Project: Traherne Court

Site Address: Neath Abbey
Neath
SA10 7EE

HA Reference: 7448/NIA1

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Client: Caredig
c/o Mango Planning & Development Ltd
Number Two Waterton Park
Waterton
Bridgend
CF31 3PH

Contact: [REDACTED]



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			Prepared by:	Checked by:
		Name	Sam Shapley BSc(Hons) MIOA	Meirion Townsend BSc(Hons) MIOA
		Signature		

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1. INTRODUCTION

We understand new air source heat pumps are proposed to serve flats 1-12 at Traherne Court, Neath Abbey, Neath, SA10 7EE.

The client has requested a noise impact assessment is submitted to accompany the planning application.

This report has therefore been commissioned to determine existing background sound levels and predict noise levels from proposed plant, allowing an assessment of the impact to be made.

2. CRITERIA

It is understood that noise guidance for ASHPs is currently under review and out for consultation. We would advise the following standards and guidance may be relevant in assessing noise from domestic air source heat pumps.

2.1 British Standard 4142:2014+A1:2019

British Standard 4142:2014+A1:2019 “Methods for rating and assessing industrial and commercial sound”, provides current guidance for the assessment of industrial noise affecting residential receivers.

This standard describes a rating method comparing L_{Aeq} noise levels from the industrial source with pre-existing background L_{A90} levels at the residential receiver. It advises at a difference (industrial noise - background) of:

- +10dB or higher, likely to be an indication of a significant adverse impact, depending on the context.
- A difference of + 5dB, likely to be an indication of an adverse impact, depending on the context.
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

A sliding scale of penalties can be applied to industrial/commercial sound levels which have acoustically distinguishing characteristics, including tonality, impulsivity and intermittency.

Tonality – A penalty of 2dB for a tone which is just perceptible at the noise receptor, 4dB where it is clearly perceptible, and 6dB where it is highly perceptible.

Impulsivity – A penalty of 3dB for impulsivity which is just perceptible at the noise receptor, 6dB where it clearly perceptible, and 9dB where it is highly perceptible.

Other sound characteristics – Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied

Intermittency – If intermittency is readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied.

BS 4142:2014 states under section 11;

"Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following.

- 1) *The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.*

Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.

Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.

- 2) *The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/ or commercial nature is likely to be perceived and how people react to it.*

NOTE 3 Consideration should be given to evidence on human response to sound and, in particular, industrial and/or commercial sound where it is available. A number of studies are listed in the "Effects on humans of industrial and commercial sound" portion of the "Further reading" list in the Bibliography.

- 3) *The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:*
 - i) *facade insulation treatment;*
 - ii) *ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and*
 - iii) *acoustic screening."*

In addition to the above, the Association of Noise Consultants (ANC) have produced a Technical Note to BS 4142:2014+A1:2019, dated March 2020 (v1.0).

It states under 'Other Contextual Matters' – *"The assessor may also wish to consider matters such as the:*

- *character of a particular neighbourhood;*
- *former uses at or close to a site;*
- *legitimacy of the industrial use, e.g. planning permissions or environmental permits;*
- *implementation of best practicable means for a given process or activity; or*
- *local convention or perceptions.*

When relying on such matters, it is incumbent for the assessor to make clear all elements of context."

It goes on to say, *"There is no theoretical limit to how the context can or should influence the impact assessment, but any alteration of the conclusions of an assessment due to context should be sufficiently explained and justified for the specific circumstances in question."*

2.2 British Standard 8233:2014

British Standard 8233:2014 'Guidance on sound insulation and noise reduction for buildings' includes internal noise criteria of habitable rooms in residential dwellings, as shown below;

Table 2.1 – BS 8233:2014 Internal Ambient Noise Criteria for Habitable Rooms

Location	Desired		Reasonable *	
	07:00 to 23:00	23:00 to 07:00	07:00 to 23:00	23:00 to 07:00
Living room	35 dB $L_{Aeq,16hr}$	-	40 dB $L_{Aeq,16hr}$	-
Dining room/area	40 dB $L_{Aeq,16hr}$	-	45 dB $L_{Aeq,16hr}$	-
Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$	40 dB $L_{Aeq,16hr}$	35 dB $L_{Aeq,8hr}$

* NOTE 7 states *"Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5dB and reasonable internal conditions still achieved."*

2.3 Planning Policy Wales

Reference to noise is made in Paragraph 6.74: Framework for Addressing Air Quality and Soundscape, which states that:

“6.7.4 The planning system should maximise its contribution to achieving the well – being goals, and in particular a healthier Wales, by aiming to reduce average population exposure to air and noise pollution. In doing so, it should consider the long – term effects of current and predicted levels of air and noise pollution on individuals, society and the environment and identify and pursue any opportunities to reduce, or at least, minimise population exposure to air and noise pollution”.

Sections 5.8 and 5.9 of PPW may also be relevant in the contextual assessment.

3. SOUND SENSITIVE RECEIVERS

In order to assess noise impact, it is first necessary to define the existing ambient and background sound climate at the agreed nearest Sound Sensitive Receivers (SSRs).

Figure 3.1 below shows the development site and the closest existing SSRs. This includes assessing the proposed plant to Flats 1-12 – excluding each properties' own unit.

For Flats 1-12 Traherne Court, habitable rooms are located at the rear facades. Bathroom and kitchens are located along the front facades. This has been confirmed by the Client.

Figure 3.1 – Site Plan Showing Nearest SSRs & Measurement Location



4. ENVIRONMENTAL NOISE SURVEY

4.1 Procedures

Continuous noise monitoring was carried out from 1530hrs on Monday, 12 August 2024 to 0930hrs on Tuesday, 13 August 2024 at position A.

Data including L_{Amax} , L_{Aeq} and background L_{A90} was logged at 1 minute intervals over the monitoring period, along with continuous audio and 100ms data to allow source identification and further detailed analysis of results if required.

Site plan in Figure 3.1 above shows the development site and continuous monitoring positions used, namely:

Table 4.1 – Continuous Monitoring Location Details

Position	Description
A	Located in close proximity to Plots 1-12, 2m from Stratton Way.

Note: All microphone positions approximately 1.5m above local ground level.

4.2 Meteorological Conditions

Approximate weather conditions are shown in time history graphs in Figure B.1 and Figure B.2 of Appendix B.

To summarise, the weather conditions during the monitoring period were dry with an occasional breeze.

4.3 Measurement Equipment

The following measurement equipment was used during the surveys:

Table 4.2 – Noise Monitoring Equipment List

Make	Description	Model	Serial Number	Last Calibrated	Certificate No.
NTi	Type 1 - Sound Level Meter	XL2-TA	A2A-19813-E0	27 October 2023	UK-23-128
	Preamplifier	MA220	10302	27 October 2023	UK-23-128
	Microphone Capsule	MC230A	A21824	27 October 2023	UK-23-128
Norsonic AS	Calibrator (113.97dB @ 999.14Hz)	1251	24202	18 August 2023	U45150(Re-issue)

Measurement systems were calibrated before and after the surveys and no variation occurred.

Note: Copies of traceable calibration certificates for all equipment are available upon request.

4.4 Results

The time history graph in Figure B.3 of Appendix B show L_{Amax} , L_{Aeq} and L_{A90} sound pressure levels measured at position A.

The graph in Figure B.4 of Appendix B show statistical analysis of background sound levels measured at positions A.

The following minimum consistent daytime and night-time background L_{A90} sound levels have been determined:

Table 4.3 – Minimum Consistent Daytime and Night-time Background L_{A90} Results

Period	Position A
Daytime (0700-2300hrs) $L_{A90,1hr}$ (dB)	45
Night-time (2300-0700hrs) $L_{A90,15min}$ (dB)	33

The background noise level was controlled by road traffic noise during the daytime and night-time.

5. PLANT NOISE ASSESSMENT

5.1 Proposed Plant

The proposed plant consists of 12no Mitsubishi QUHZ-W40VA units, each unit is serving one flat. For a robust, worst-case assessment, it is assumed all heat pumps have the potential to operate simultaneously during a 1hr daytime or 15minute night-time assessment period.

1no heat pump in normal operation has the following sound pressure levels quoted by Mitsubishi:

Table 5.1 – Sound Pressure Levels of Proposed Unit

ASHP	Sound Pressure Level Measured at 1m dB								dB(A)
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
Mitsubishi QUHZ-W40VA	46	45	46	41	36	33	26	21	43

The units are approximately 0.7m in height.

Discussions around the placement of units have been carried out with the design team to arrive at the final proposed layout, maximising screening in line with best practice and Good Acoustic Design principles.

5.2 BS 4142:2014+A1:2019 Rating Level

An initial assessment of possible BS 4142:2014+A1:2019 industrial characteristic penalties has been undertaken to give an indicative rating level.

For an initial assessment, taking into account the expected sound characteristics of the ASHP sources, distance and screening losses, and absolute plant noise levels, a 5dB rating penalty has been applied.

This is based on a 2dB penalty for tonality being just perceptible and 3dB for intermittency.

The overall rating level is to be incorporated into the noise impact assessments for each scenario.

5.3 Model Results

5.3.1 Parameters

Three-dimensional noise map modelling has been undertaken using the proprietary Predictor V2024.1 environmental noise mapping software package, which in turn uses calculation methods of ISO 9613.

Models have been set up to predict plant $L_{Aeq,T}$ noise levels at the nearby noise sensitive receivers 1m from the façade. Each ASHP serving the individual flat has been excluded from the cumulative level at that position.

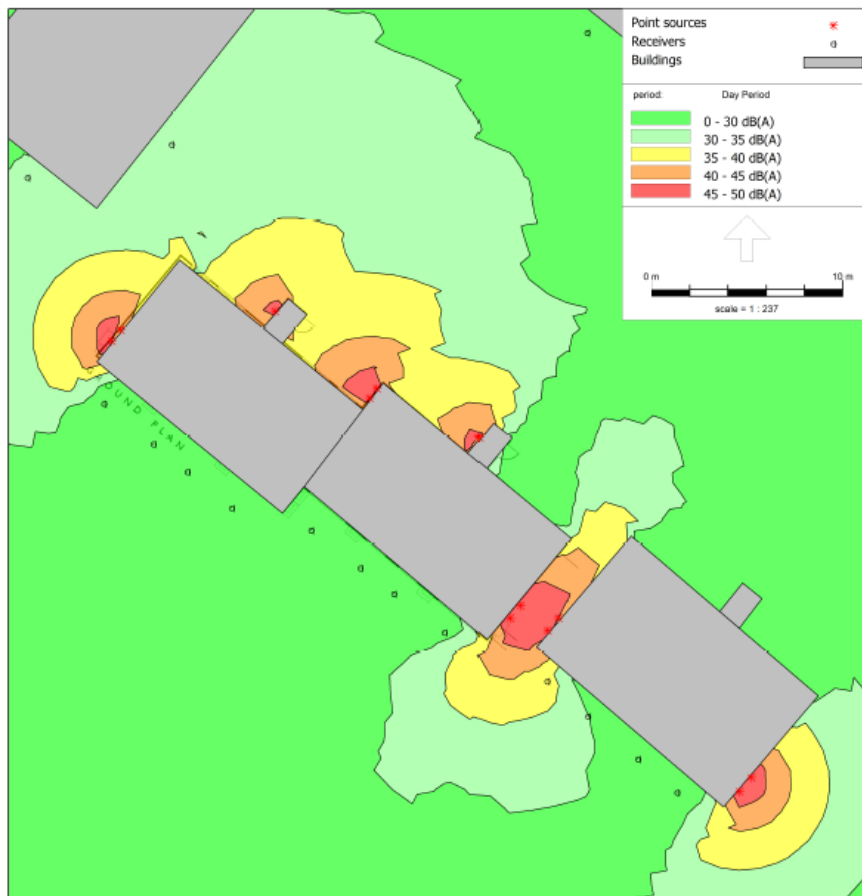
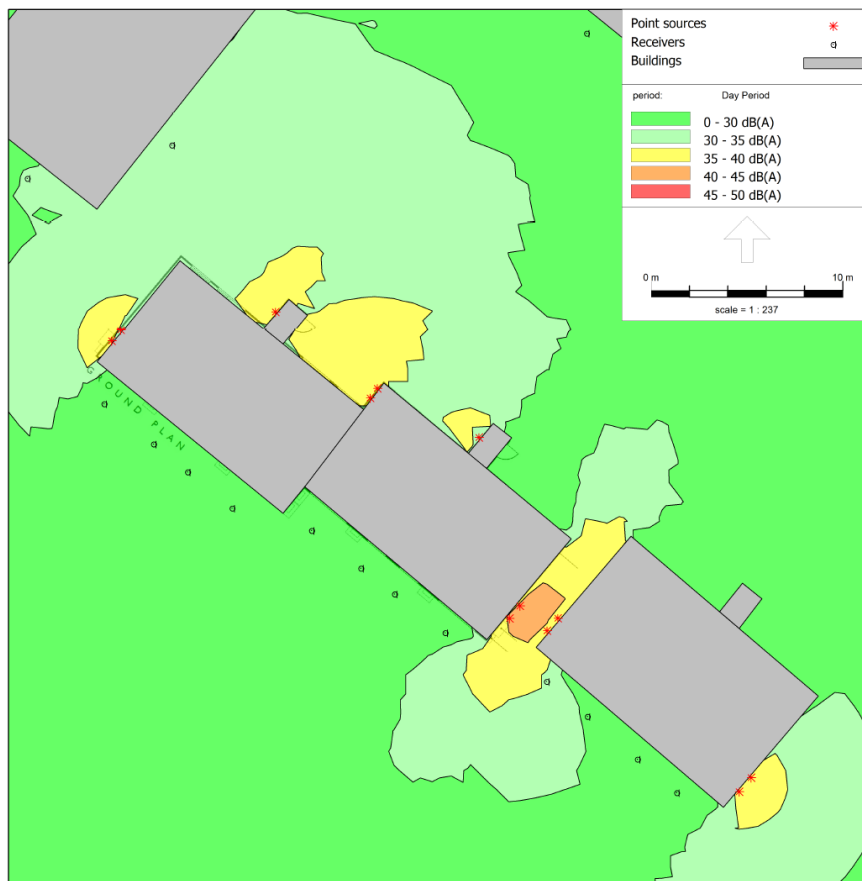
The model takes into account distance and screening losses from existing structures.

5.3.2 Model Results

The expected noise levels of the proposed plant have been modelled to assess noise levels at habitable rooms at ground floor (1.5m) and first floor (4.5m) levels.

Note: Habitable rooms include bedrooms, lounges, dining rooms and kitchen/diners but not kitchens or bathrooms.

The respective contour noise levels of the plant are shown in the models below:

Figure 5.1 – Noise Map $L_{A_r,Tr}$ Contours at 1.5m HeightFigure 5.2 – Noise Map $L_{A_r,Tr}$ Contours at 4.5m Height

The most critical sound sensitive receivers to the proposed plant are highlighted below.

Table 5.2 – Noise Model Predictions

SSR	Plant Absolute Level $L_{Aeq,T}$ (dB)	Plant Rating Level $L_{Ar,Tr}$ (dB)	Daytime Background L_{A90} (dB)	Night-time Background L_{A90} (dB)	Excess over Critical Night-time Background
Flat 1	23	28	45	33	-5
Flat 2	23	28	45	33	-5
Flat 3	37	42	45	33	9
Flat 4	35	40	45	33	7
Flat 5	27	32	45	33	-1
Flat 6	26	31	45	33	-2
Flat 7	19	24	45	33	-9
Flat 8	19	24	45	33	-9
Flat 9	17	22	45	33	-11
Flat 10	15	20	45	33	-13
Flat 11	27	32	45	33	-1
Flat 12	25	30	45	33	-3

Rating levels at neighbouring properties are indicated to range between 20-42dB $L_{Ar,Tr}$.

A BS4142:2014+A1:2019 assessment is set out for the most critical receptor (Flat 3) in Table C.1 of Appendix D.

For Flats 3 and 4, BS4142:2014 would assess this as an adverse impact is likely depending on context.

For all other flats, BS 4142:2014 would assess this as an indication of low impact depending on context.

Context for the above results is discussed in section 0 below.

5.4 Context

5.4.1 Absolute Sound Levels

Referring to Section 11 of BS4142 (quoted in 2.1 of this report) the following section outlines the context:

BS4142 advises: "Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night."

Absolute levels from ASHP noise are considered to be low at 15-37dB L_{Aeq} externally.

Comparing the existing night-time ambient noise levels (ranging between 36-52dB $L_{Aeq,15min}$) to the predicted absolute levels detailed in Table 5.2, the absolute noise levels are indicated to fall below or within the lower boundaries of the existing range of ambient noise levels.

Applying a 15dB loss through a partially open window, internal noise levels from ASHPs are indicated to fall well below 30dB L_{Aeq} . (desirable internal levels set out in BS 8233:2014 (refer to in Table 2.1).

Outcome: Modification of impact due to low absolute noise levels. Outcome modified to indication of adverse impact less likely.

5.4.2 Character of Specific Sound level

BS4142 advises: "Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound."

Corrections for plant potentially exhibiting tonality that may be just perceptible and also intermittent characteristics have been included for in the assessment.

Outcome: No modification of impact due to acoustic characteristics.

5.4.3 Summary

Based on the context set out above, it is considered that at an adverse impact is less likely with the introduction of the air source heat pumps at the two critical flats (Flat 3 and Flat 4). A low impact remains at all other flats.

6. CONCLUSION

An assessment of the proposed air source heat pumps has been carried out for the development at Traherne Court, Neath Abbey, Neath, SA10 7EE.

Continuous noise monitoring has been carried out on site in order to assess the existing ambient and background sound climate.

A noise impact assessment has been carried out in line with BS 4142:2014+A1:2019.

Predicted noise levels indicate an adverse impact likely at the two most critical flats (Flat 3 and Flat 4). However, with context considered (refer to Section 5.4), this has been modified to an adverse impact less likely. A low impact remains at all other flats.

APPENDIX A - ACOUSTIC TERMINOLOGY

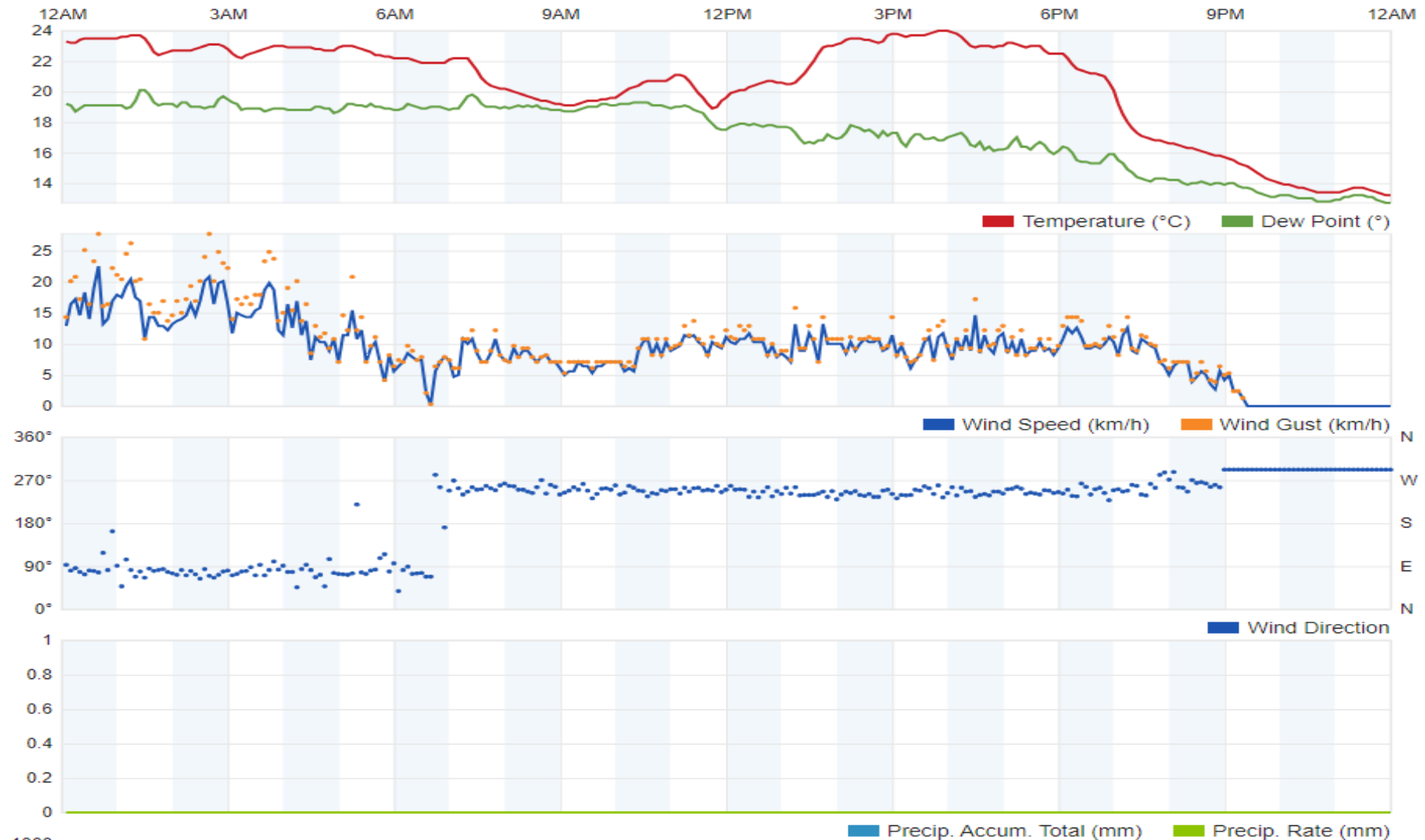
Human response to noise depends on a number of factors including loudness, frequency content and variations in level with time. Various frequency weightings and statistical indices have been developed in order to objectively quantify 'annoyance'.

The following units have been used in this report:

dB(A)	The sound pressure level A-weighted to correspond with the frequency response of the human ear and therefore a persons' subjective response to frequency content.
L_{eq}	The equivalent continuous sound level is a notional steady state level which over a quoted time period would have the same acoustic energy content as the actual fluctuating noise measured over that period.
L_{max}	The highest instantaneous sound level recorded during the measurement period.
L_{10}	The sound level which is exceeded for 10% of the measurement period. i.e. The level exceeded for 6 minutes of a 1 hour measurement.
L_{90}	The sound level which is exceeded for 90% of the measurement period. i.e. The level exceeded for 54 minutes of a 1 hour measurement - used as a measure of background noise.
$L_{Ar,Tr}$	The 'rating' level, as described in BS 4142:2014 – the specific noise plus any adjustment for the characteristic features of the noise.
SSR	Sound sensitive receiver

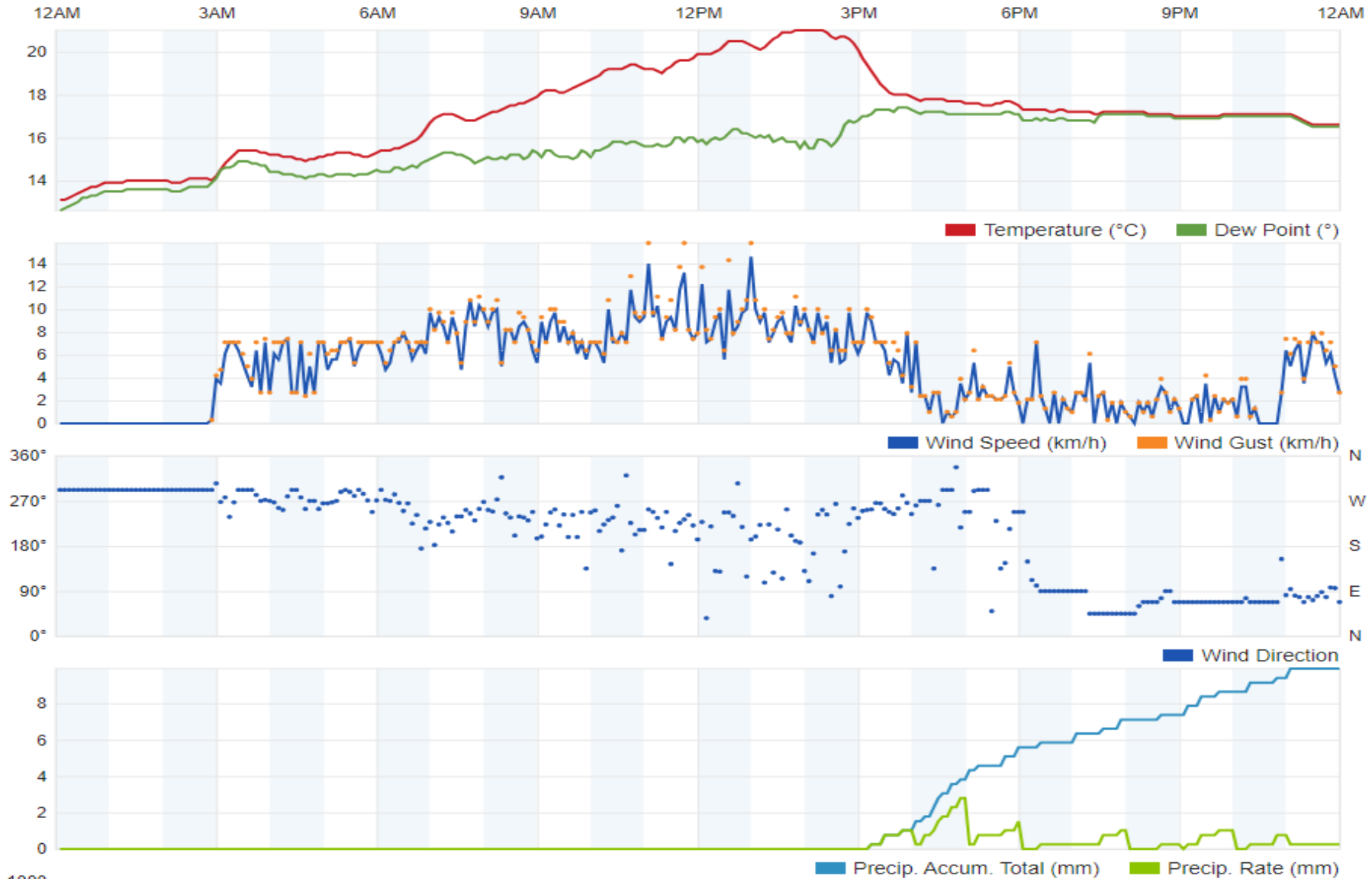
APPENDIX B - DIAGRAMS, GRAPHS AND TABLES

Figure B.1 – Approximate Weather History for Monday, 12 August 2024



Note: Taken from www.wunderground.com - weather station INEATH13 located in Neath [Elev 67 m, 51.66 °N, 3.85 °W]

Figure B.2 – Approximate Weather History for Tuesday, 13 August 2024



Note: Taken from www.wunderground.com - weather station INEATH13 located in Neath [Elev 67 m, 51.66 °N, 3.85 °W]

Figure B.3 – Time History at Position A (Monday, 12 August 2024 to Tuesday, 13 August 2024)

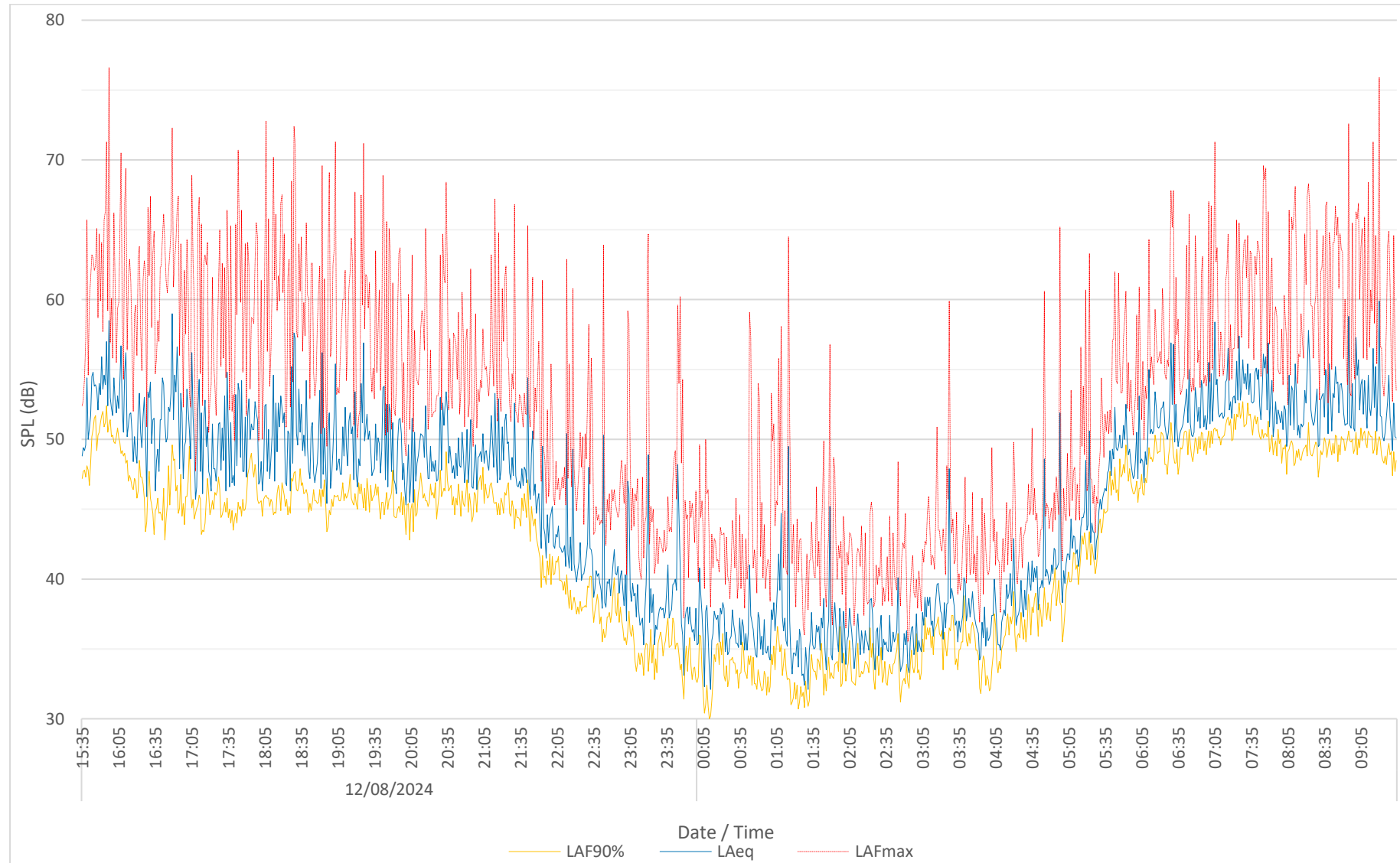
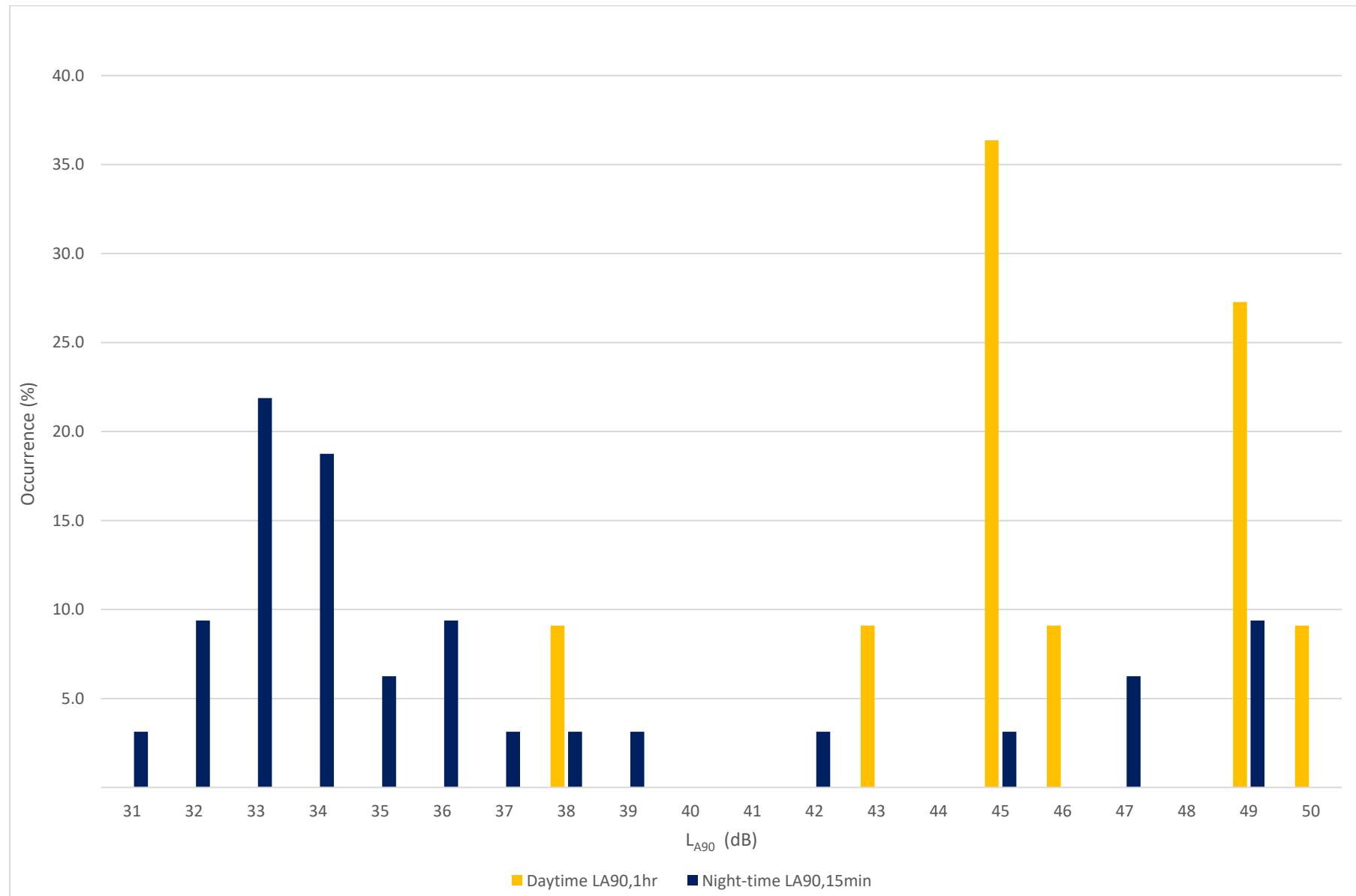


Figure B.4 – Statistical Analysis of Background Sound Levels Measured at Position A



APPENDIX C – BS 4142:2014+A1:2019 ASSESSMENTS

Table C.1 – BS 4142 Night-time Assessment at Flat 3

Results		Relevant Clause	Commentary
Predicted Level of ASHP noise 1m from Flat 3's habitable room façade	$L_{Aeq,15min} = 37dB$	7.3.2	Calculated using noise mapping software – see Table 5.2.
Background sound level (night-time)	$L_{A90(2300-0700hrs)} = 33dB$	8.1.1 8.1.3 8.3	Representative background sound level measured at Position A – see Figure B.4
Assessment made during the night-time so the reference time interval is 15mins.	+/-0dB	7.2	Unit has been modelled to operate constantly over a 15minute period.
Acoustic feature correction	+5dB	9.2	2dB for just perceptible tonality and 3dB for intermittent characteristics have been allowed for.
Rating Level	$(37 + 5) = 42dB$		
Background sound level (night-time)	$L_{A90(2300-0700hrs)} = 33dB$	8.3	
Excess of rating over background sound level	$(42 - 33) dB = 9dB$	11	
Assessment indicates adverse impact likely depending on context		11	At 9dB above background BS 4142:2014 advises: "is likely to be an indication of an adverse impact, depending on the context". Context is discussed in section 5.4.
Uncertainty of assessment		10	Uncertainty in background noise measurements is considered low.

APPENDIX D - NOISE MODELLING

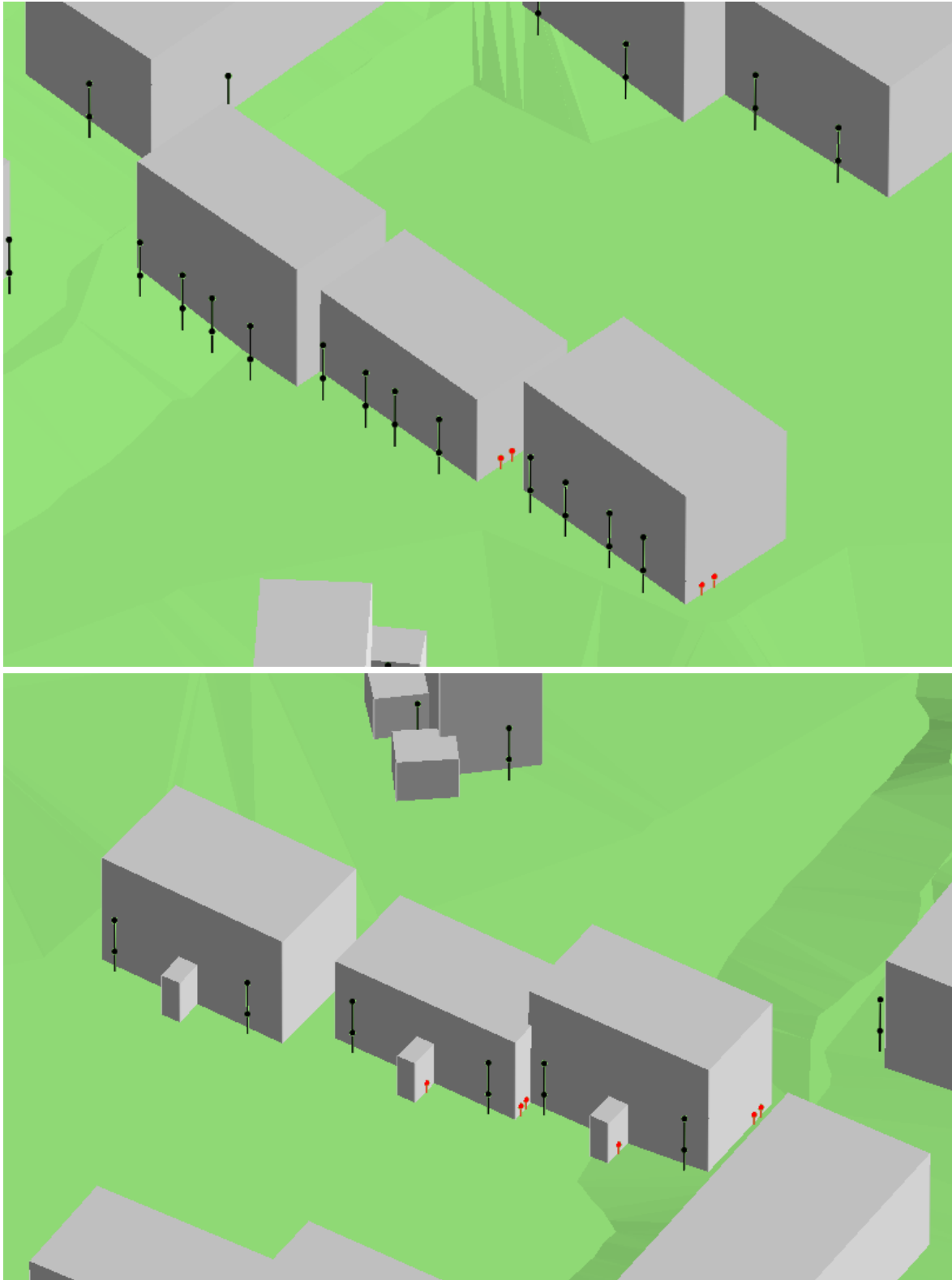
D.1 Noise Model Input Data

Table D.1 – Fixed Plant Noise Data Used in Model

Plant Item	L_w at Octave Band Centre Frequencies, Hz (dB)								L_{wA} (dB)
	63	125	250	500	1000	2000	4000	8000	
Mitsubishi QUHZ-W40VA	48	47	48	43	37	35	27	23	53

D.2 Noise Model 3D Views

Figure D.1 – 3D Model of Site with Proposed ASHPs and Windows



APPENDIX E – LIST OF DRAWINGS

The following Buckmaster Batcup Architects drawings have been used in our assessment:

Table E.1 – Drawing List

Drawing Title	Drawing Number	Rev	Date
Block A (No's 1-4)	BBA 952.P.03C	A	27/8/24
Block A (No's 5-12)	BBA 952.P.05C	A	27/8/24